DOCUMENT RESUME

ED 281 390 FL 016 667

AUTHOR Hellwig, Harold
TITLE Computer Interpretation of Meaning.
PUB DATE Oct 86
NOTE 25p.; Paper presented at a conference on Computers in Language Research and Language Learning (Urbana, IL, October 25-26, 1986).
PUB TYPE Reports - Evaluative/Feasibility (142) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Association (Psychology); Association Measures; *Case (Grammar); *Computational Linguistics; *Computer Software; Connected Discourse; *Discourse Analysis; Fiction; *Narration; Nineteenth Century Literature; North American Literature; *Semantics
IDENTIFIERS *Twain (Mark)

ABSTRACT

A computer program devised to analyze text by the use of case grammar is described. The program tests a text against the expectations created by a narrative situation and by the connotative values in the narrator's choice of words. It determines spatial concepts attached to various English words and analyzes the spatial relationships in syntactic structures. The assumptions and mechanisms of the approach are outlined, and the results of the program's application to Mark Twain's "Letters from Hawaii" and "Connecticut Yankee in King Arthur's Court" are discussed. (MSE)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED281390

"Computer Interpretation of Meaning"

Dr. Harold Hellwig
Department of English
Iowa State University
Ames, Iowa 50011

Theoretical Foundations

Most computer programs that analyze sentence and word structures are based on procedural representations of knowledge. These systems study natural language (any human language) according to how most syntactic and semantic patterns are used by language users. That is, the programmer asks the linguist for rules that govern the language and then encodes these rules into the program. Given a text, the computer program tries to fit these words into categories and structures according to these rules. These algorithms are then used to prepare production-based rules for diagnostic programs in linguistic analysis and feedback systems. If used as a diagnostic tool, the production-based system assumes that all of the text to be read must fit an ideal model of a given utterance, and, if not found, it determines possible alternative responses for that text.

Another way to guide a linguistic analysis comes from frame representation theory. Here the assumption is that we can train a computer to "think" associatively. A frame system describes the relationships between objects in terms of goals, potential activities, and locations. Any object in space has a particular set of attributes given it by its relationships to other objects in space. We use frame representation to react to situations and

FL016667

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

H. Hellwig

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

contexts. In a restaurant we expect to pay for our food and service at the end of our meal; in a fast food place we must pay in advance. A traditional play contains characters, plot, and scenery on a stage--and we participate in that play by purchasing our tickets before we march in at an appointed hour, by sitting in assigned seats (usually), by listening to the play attentively, and by getting up and sitting down at scheduled times. In the restaurant and at the play we obey the expectations of the moment--we don't expect to be served food at the play, nor should we demand a Chekhov play at the restaurant. But both contexts have scripts that we follow--and at a dinner theater, we change the conventions to accommodate a new script.

In frame-based systems, relationships between objects and the expectations for these relationships are paramount. A computer program based on frame representation theory is often termed a "semantic grammar" or "case grammar" program. In my research for my dissertation at the University of California, Los Angeles, I developed a computer program that observed a number of algorithms to test a text against the expectations given by a narrative situation and by the connotative values revealed by the narrator's choice of words. A limited program, this set of algorithms follows the case grammar approach as closely as possible. The name for this program is BOSS, Basic Organizer of Syntax and Semantics, a name chosen for its literary ancestor, the Sir Boss of Mark Twain's A Connecticut Yankee in King Arthur's Court, a narrator who imports technology into the land (and time) of King Arthur.

A semantic differential scale, as developed by Charles Osgood and implemented by David R. Heise, was used to determine the spatial concepts attached to various English words.[1] A frame representation of syntax with

BEST COPY AVAILABLE

the use of case grammar arguments, as discussed by Charles Fillmore, was also implemented to analyze the spatial relationships in syntactic structures, basically in terms of the narrator's involvement or non-involvement with the created fictional environment.[2]

Osgood's method of semantic analysis involved testing words and word pairs with connotative values or concepts, using many subjects who reacted to word combinations with the range of connotative values assigned to pairs of words. Is the word "lady" "tough" or "tender," and by how much? Is the word "woman" "tough" or "tender," and by how much? And, similarly, is the word "lady" as "interesting" as the word "woman"? (I am oversimplifying the technique of word combination/connotative value testing used.) Osgood attempted to match a variety of adjectives to words in terms of numerical ratings in order to locate common spatial relationships and universal concepts held by English words. Using factor analysis, he discovered that people tend to react to words according to connotative values of evaluation, potency, and activity. The color "red" carries a connotative set of concepts that are not shared by the color "white." People tend to think that red objects are livelier and more powerful than white objects. A word can also convey a negative or a positive connotation; the word "fear" is an obvious example.

Each word contains the same set of connotative values but in different degrees. For example, someone can experience "anxiety," a somewhat negatively charged, and passively accepted word, but if the word used is "terror," then the levels of negativity, power, and activity rise for the reader. These levels were quantified by testing thousands of subjects in terms of their reactions to words, word-pairs, and concepts.[3] After initial testing

indicated that evaluation, potency, and activity levels were the main spatial concepts behind each word--how active is "red" compared to "white"? how favorable? how powerful?--David Heise profiled the most common 1,000 English words, excluding function words. The word "agree," for example, has a numeric score of 0.26 for evaluation, -0.90 for activity, and -0.28 for potency. On a scale of -3.00 to 3.00, positive scores being "good" or "active" or "tough," the word "agree" seems rather limp in activity and power. The word "happy," in contrast, received an overall rating of 1.64 for evaluation, 1.79 for activity, and -2.29 for potency--a "better" word, yes, and livelier, too, but much less powerful than the word "agree."

I decided that this technique of assigning a range of values to words might be useful for the analysis of literature, particularly the narrator's general reaction to the environment as indicated by the levels of evaluation, potency, and activity. Into my computer program, I encoded Heise's scales, a set of numbers more or less equivalent to the average responses of thousands of subjects responding to those 1,000 words in terms of the major factors given by Osgood. His dictionary used as a range of numerical ratings a +3.0 to show the "most powerful, most good, and most active" values a word can have, and a -3.0 for the "least powerful, least good, and least active" values.

One of my major assumptions was that a narrator would reveal with the kinds of words used to describe a situation or context the level of acceptance of that situation or context. If a narrator described a scene in words that suggested on average a negative, passive, and weak response, then that narrator might well be overwhelmed by the context. Similarly, if a narrator used active, strong, and positive words to describe a place, then that narrator might well

be overjoyed by the situation. The first hypothetical narrator might not trust the fictional environment, while the second would.

Another major assumption was that case grammar analysis would reveal the kind of narrator involved in the fiction created, whether, for the purpose of my analysis, the narrator was an Agent, someone actively engaged in the fictional universe, or an Experiencer, someone allowing events to happen without trying to intervene in that fiction. If a narrator was an Agent, then I could claim that the narrator felt responsibility for and shared in the events of the narrative. If the narrator was an Experiencer, then I could claim that the narrator felt little responsibility for and did not share in the events occurring in that fiction. This assumption is common in literary criticism in terms of authorial-distance and point-of-view studies, where critics assign more "trust," if I can state it that way, in narrators who interact directly in their texts with other characters, and also assign less credibility to narrators who merely report the events of the story.

The final assumption was that I could combine the semantic scores found in a text with the kind of narrator shown by it. I assumed that an Agent as a narrator would tend to use more active, more positive, and more powerful words than an Experiencer. My initial observations confirm that assumption to some degree; the potency level did not always level out that way. In terms of the texts I did analyze with BOSS, Mark Twain's early and late writings, the Agent seemed to vacillate between weak and powerful words, although the Experiencer did tend to use more powerful words than weak ones, at least in texts that seemed ordinary and relatively open to interpretation. Sometimes the context determined the kinds of words used, and hence the semantic scores, rather than

the narrator's relative faith in that context. For example, as a journalist writing about the Hawaiian natives as an Experiencer, writing about the cultural demise of these natives, the hardships, the European/American influences changing old customs and traditions, Twain tended to use words that were rather powerful and active rather than the expected set of words--but then the context determined the content as it did the set of values assigned by the computer. Twain revealed with the evaluation scoring that he tended to side with the natives rather than with the missionaries and colonialists; "good" values appear when he discusses the Hawaiians, and "bad" values arise when he describes various outsiders.

Given a fictional disourse, though, I wanted to find out what the semantic spheres of influence were on the narrator, and use that analysis to look at the content provided. If a work of fiction contained an Agent who tended to use weak, passive, and negative words, then I wanted to treat that text with some caution and doubt, especially if the context suggested that the Agent felt sympathy for other characters in the story, because then the semantic scores differed from the usual set of scores one might expect from someone who did trust in others (the difference of someone saying "oh sure," and someone else saying "yes" to a request).

Semantic Levels

I used the mean score for each connotative value, counting the number found in the semantic differential dictionary in each sentence and dividing the raw total of the scores obtained by that number, to determine the overall direction each sentence pursued. The parser also kept track of standard

deviation scores for "found" words in order to indicate the connotative direction: these scores were used to locate and to isolate (for hand analysis) sentences that contained few "found" words. The program, as it now exists, prints each sentence map and the numerical scores obtained, so that I could examine the general accuracy of the program.

Case Grammar

A case grammar study unlayers the logical functions for noun phrases as determined by linguistic convention and how sentence predication modifies meaning. Predication consists of a verb and a number of noun phrases which show notions of Agency, Instrumentality, Experiencer, Source, Goal, Path, Location, Possession, Receiver, and Force (among others). Role relations determine what functions noun phrases can play in a sentence. Normally, one cannot say meaningfully that "lightning willingly hit the box," because a Force has "no volition," while "I willingly hit the box" can exist as a linguistic utterance because an Agent does have responsibility and volition in actions.

Elizabeth Traugott, for example, as a literary critic using case grammar principles, discusses Moll Flanders in terms of the character's inability to take responsibility for her actions.[4] The logical arguments to the narrative voice in that novel indicate that Moll would rather be an Experiencer, Possessor, or Patient than an Agent. The irony in the novel shows the religious hypocrisy Moll exhibits (and which, presumably, Defoe uses to exemplify contemporary mores). Moll's final conversion seems entirely false, because she could not act genuinely, being deprived of the power to act, and being content to remain an Experiencer or Possessor. Traugott uses this analysis to indicate which edition of the text might have been revised by

someone other than Defoe, depending on the changes to the later texts which show Moll as an Agent-motivated narrator (219).

Programming the Theory

I was concerned mostly with Experiencer and Agent arguments in a text, in order to decide on Twain's relative trust in his narrator in much the same vein of irony. I depended heavily on the use of prepositions and verbs as logical determinants in noun phrases. An Experiencer uses few active verbs and many prepositional phrases that indicate Location, as in "I was in London at the time." An Agent might well write "I made my home at London then," showing an active interest in the city as well as indicating London to be a Path along life's road. Prepositional phrases generally represent role relations--"by" can indicate a conveyance, beneficiary, or instrument; "into," a location, a path; and so on. The kind of prepositional phrase could also pinpoint the kind of narrator, given the proper heuristic procedure.

With PASCAL as my computer language, an IBM 3033 mainframe, the resources available at UCLA, and the help of a few computer specialists--I designed and wrote a working program that would indicate Mark Twain's relative acceptance of cultural values, in early writings as well as in later work.

The syntax parser that I developed in order to approach a frame representation of content analysis is, at first, procedural, dependent on linguistic rules, developed ad hoc to accomodate host computer limitations and narrowed design limitations, and according to a parsing tool termed an augmented transition network system (or ATN).[5] Given a central list of words and word roots of about 1,045 keywords, the parser looks for words that match the computer dictionary and decodes the text according to what is known.

Function words, such as articles, prepositions, and pronouns, and major nouns and verbs are tagged in an initial pass at the sentence. Scores derived from successful matches to the semantic differential scale dictionary are also tabulated automatically at the same time. The parser hunts for a subject of the sentence, defined as a noun phrase with a determiner, a modifier, and a main noun--searching, for instance, for an adjective or a noun after the determiner until it finds a noun or a verb. If successful in that search, then the ATN labels the noun phrase as a potential subject (even if there is no determiner or adjective), and looks for the verb, whether simple, transitive, intransitive, or auxilliary. The ATN parser moves through a number of heuristic pathways, looking for pre-determined syntactic clues, labelling noun phrases in terms of subject and object. The ATN can locate complement-embedded sentence patterns and a variety of other phrases.

Almost at the same time the ATN double-checks each word for suffixes to determine singular and plural cases, as well as to re-check some words in the semantic differential scale dictionary against those words with "s" and "es" endings--in some cases, also "ing" and "ly" endings (depending on the syntactic structure revealed)--to locate words not otherwise given in the semantic differential scale dictionary (like "loves," which appears as "love" only). If the syntactic structure indicated the strong possibility that a word, thus stripped of its suffix, could be used by the semantic differential scale test without warping the connotative scoring--usually adjectives and gerunds could substitute for nouns or verbs found in the central dictionary--then the word's connotative levels were included in the semantic scoring. This suffix-hunting operation saved memory in the computer, so that root words could be used rather

than each stem and its derivatives. Some ambiguous words, those words with a number of variant meanings, and, consequently, variant levels of scoring, had to be eliminated from the semantic differential scale dictionary that I prepared (this shortened the list in the semantic dictionary to around 650).

A similar ATN on a more global scale then re-examines the sentence in terms of case grammar arguments. With the right heuristic in place for noun phrases, pronouns, and kind of verbs being used, the case grammar ATN deciphers the narrator's involvement with the fictional universe. Let's use a very brief example concerning the use of the preposition "under." If "he is under the table," then "he" should be labelled as an Experiencer, because the verb is passive and the prepositional phrase is a Location; if the verb had been active (the subject animate), then the arguments change to Agent/Path. (There are about six hundred and forty pathways that can be taken, given a subject, verb, object, and prepositional phrase--for each of the forty-three prepositions that I used.)

Various statistical measures--such as chi-square analysis figures, standard deviation scores, and raw counts of both case grammar arguments and parts of speech--case grammar "maps," and sentence "maps"--symbolically translated maps of syntactic components--are then printed automatically at the end of each sentence analysis. The program also suggests what can be described about the chief narrator's level of faith in what he or she says. A fairly complex algorithm compares the average semantic differential scores with the dominant case grammar arguments and prints, from a range of possibilities, one diagnostic response--basically this algorithm assumes that an Experiencer would exhibit a tendency toward using a passive and powerless connotative word

choice. Here's an example of one sentence analysis:

```
Unlimited power is the ideal thing     JN=AJN
when it is in safe hands.              <S=PJN

Case Grammar Map:  --S,--S,-EXP, LOC,-S
Evaluation Standard Deviation Score: 0.936
Potency Standard Deviation Score: 0.918
Activity Standard Deviation Score: 0.907
Evaluation Score: -0.22
Potency Score: 0.45
Activity Score: 0.24

The Semantic Differential Scale Average suggests
          The Experiencer
      Exhibits--
          Somewhat uncertain
          Somewhat powerful
          Somewhat active
                   --Acceptance
The semantic content seems undercut by the case grammar structure.

Dominant arguments for this sentence include:
1 Location(s)      2 Experiencer(s)        3 Source(s)
```

The computer also automatically reproduces a full set of comments at the end of chapters or full samples. This final set of analytical comments for each section of text extends the sentence-by-sentence data by providing the following: a final sum of the kinds of parts of speech; raw totals for words, sentences, and averages for words per sentence; a final count for words matched against the semantic differential scale dictionary, with an average for words found against total words in the text; a sentence histogram to indicate the relative length of sentences; chi-square scores, standard deviation scores, and overall means for evaluation, potency, and activity levels; a final count of the case grammar arguments; a diagnostic comment similar to the sentence-level analysis that suggests how the case grammar argument for the narrative voice

relates to the overall average scores of the semantic differential scales; and, finally, a warning to interpret carefully the data produced.

The warning should serve all users of any linguistic computer program, because the tendency to accept the analysis with blind faith can be tempting. Although the success rate for correct parses of a text is high--roughly 80%--the notable failures at fathoming some sentences for my program is awkward, at best, to defend. That is why the program generates enormous amounts of paper, so that I do have a sentence map and a separate analysis of each sentence. I needed to analyze by hand the results obtained to make sure they were right with each sentence. This was an attempt to begin the development of some kind of automatic parsing tool that could examine the narrator's relative sincerity within a fictive construct. It did work, but it is a rather narrow program in scope. It lacks a context analyzer, so that it could discern differences in discourse genre. It lacks the memory to recall patterns in the text or inherent structures in narrative voice. I am now developing new programs to take into account context and narrative patterns.

Using the Program on Sample Texts

The Letters from Hawaii provide a useful test database. An analysis of these early letters finds a text dominated by an Experiencer as a narrator, one who writes directly of his feelings. Semantic differential scores also suggest that activity and potency levels are unstable while the evaluation score (as a mean) remains relatively consistent. This evaluation score presents a narrator who is slightly uneasy or uncertain about the Church, the treatment of Hawaiian natives, and the establishment of democracy in Hawaii.

"Reading" Mark Twain's Early Response

Twain's Letter 25 from Letters from Hawaii, where he describes the volcano Kilauea upon first seeing it, may serve as one sample. Of the 2,412 words analyzed, some 566 were matched to the semantic differential scale dictionary. Overall, the text suggests that the narrator operates from the Experiencer mode, someone who is slightly uncertain, slightly weak, and slightly passive in his choice of connotative words.

The letter begins with an Agent, someone in control of his environment, but this Agent seems passive and uncertain in his response to the volcano. This is consistent with the context, where Twain writes as one who is about to confront a volcano with some disappointment. The narrator then shifts to an Experiencer mode when using an analogy to discuss how a house, a woman, and a natural wonder improve with familiarity. Here the Experiencer is weak and passive, essential qualities for an Experiencer. But then the connotation becomes active; on first seeing the volcano, the Experiencer begins to vacillate between uncertainty and positive reaction. Twain, at this point in the letter, shuts his eyes to the volcano in order to allow it freedom to grow in his imagination. The semantic vacillation reflects behavior. On facing the volcano directly, the narrator now becomes an Agent again, but responds passively, and becomes increasingly uncertain and slightly weak.

The narrator then becomes an Experiencer once more, upon describing the volcano. The narrator shifts rapidly between an Agent-driven voice and an Experiencer-driven voice in this descriptive passage. When an Agent, the narrator is consistently positive, weak, and active; when an Experiencer, the narrator is consistently uncertain, weak, and passive. The connotative values can be said to be reliable here in terms of how an Agent or an Experiencer

react to the environment being created. Nature can overwhelm an Experiencer, but can be admired by an Agent. Potency levels remain even for both the Agent and the Experiencer modes of narration, suggesting that Twain felt unimpressed by the volcano. Irony is revealed; Twain's surface response that the volcano seems impressive is undercut by the semantic loadings shown.

Indeed, when the volcano "grows" in Twain's imagination--the stated surface of the message--the Experiencer mode in charge becomes active, positive, though very weak. The computer analysis suggests at this point that the semantic loading undercuts the case grammar argument structure. When the full realization of the volcano becomes clear, the Experiencer as narrator feels overwhelmed by power-charged words and quite active loadings of the semantic content. Uncertainty remains. The Experiencer then retreats to a passive, though slightly powerful state, after this fully realized vision of the volcano emerges.

The nighttime scene of the volcano retains the Experiencer as narrator. Consistently uncertain, the Experiencer vacillates between passivity and activity--even as he uses powerfully charged words--and becomes passive with each sentence. The narrator then looks at the people around him, describing the effect of the volcano on them (especially the colors and lights on their faces). This narrator, according to the program's analysis, lacks a defined case grammar argument for the narrative voice, becoming positive, powerful, and active (qualities of an Agent in general). The Experiencer returns. Again looking at the volcano, the Experiencer is uncertain and weak, then vacillates between power and weakness, but consistently remains passive.

The narrator then looks at the imaginative qualities to be had by

looking at the volcano. While remaining uncertain, the Experiencer is weak and passive at first, but then increases in power and in activity. In the following description passage the Experiencer is weak, passive, though generally positive. When an Agent, the narrator is positive, active, and weak, supporting the general context. The chief narrator remains the Experiencer. Finally, while using an Biblical analogy, the narrator becomes weak, passive, and uncertain. Nature overwhelms the narrator. Upon the full realization of the comparison, the narrator remains uncertain, but becomes active, and powerful in connotative usage. Nature threatens in force.

Destroying the Self and the Technology of One's World

In A Connecticut Yankee in King Arthur's Court, Twain allows the natural world to disintegrate with the volcanic destruction of capitalism and technology. If the volcano threatens the narrator in Hawaii, then the force unleashed on the fictive world of the Connecticut Yankee becomes a realized dream, one that will trouble the narrator with the implied disavowal of civilization.

Twain wrote this chapter after much of the novel had been completed, inserting it in order to accommodate what he felt to be a blunder in chronology. He wanted to substantiate the underground technology that the Yankee had developed, so that the novel's later references to machinery that the Yankee had developed would appear more natural. Thus the chapter may serve to underscore the attitudes that Twain may have felt during the writing of the last parts of A Connecticut Yankee. It is, one rightly suspects, an interesting chapter in terms of the semantic loading and the case grammar arguments found.

I used some 956 words from the opening eight paragraphs as my sample, having considered the rest of the chapter to be roughly equivalent to the first half. The number of found words from the semantic differential scale dictionary is 247, with a ratio of found words to total number of words of 0.26. The final standard deviation scores for evaluation, potency, and activity are 0.62, 0.55, and 0.51, well within the average range of standard deviation scores for the entire corpus.

For the first time in the analysis of the novel, the computer program finds an Agent dominated text, one who is slightly positive in evaluation, the other scores falling in the neutral range (though the activity mean is very slightly active). This does seem a bit surprising, considering the usual narrative voice found. It will pay to analyze in some detail what the individual sentence survey relates in terms of the narrator's interaction with his environment. How much faith does the Yankee (or Twain?) invest into his machine-world?

The opening sentence suggests that the semantic levels undercut the case grammar structure, as the narrator, labelled as an Experiencer, uses connotative words that are somewhat positive, weak, and somewhat active, levels that betray a shift in perspective. When invited to participate in the usual adventure that a knight must undertake now and then, the Yankee demurrs; here, as an Agent, he is somewhat weak and slightly passive in response, scores that more properly could be applied to an Experiencer. In delaying the pursuit of an adventure, the Yankee's semantic loadings indicate a consistent passivity and weakness; he claims to need more time to get his things in order, in short, to solidify his power. Still an Agent, the Yankee's level of uncertainty rises

when he says that it will take him "three or four years" to have his system "going smoothly," indicating some doubt that he can be ready for Sir Sagramore's challenge at that time. But the potency level for following sentences indicates that, given those few years, the Yankee feels strong about his ability to prepare himself, here as an Experiencer, for the development of a new society. The following sentences confirm the trend being developed. Potency, evaluation, and activity scores suggest that the Agent responds positively, powerfully, and actively to the hope that should Sir Sagramore take longer on his quest for the Holy Grail his "system and machinery" would be "well developed" enough so that he "could take a holiday" and meet Sir Sagramore's challenge. The charged sentences that exist here show the boundless optimism the Yankee has in his technology and in his new society, hidden though it may be. The positive evaluation that the Yankee has continues throughout his discussion of the beginnings of his civilization.

One shift does occur: when discussing how he has trained "an ignorant folk into experts," the Yankee is slightly uncertain, neutral in strength, and somewhat active--as an Experiencer. The Yankee says he "was training" these people; the word "training" is essential to the later, often quoted, passage in chapter 18, where the Yankee admits defeat in the midst of inherited ideas and inherited "training." Here, the semantic content reflects the uncertainty about the effectiveness of his educational methods. Other sentences on his system of "Sunday schools," "graded schools," and a "teacher factory" indicate uncertainty, passivity, and a slightly powerful response to the content, generally voiced by an Experiencer in those sentences. This shows an Experiencer who is overwhelmed by events over which he lacks control.

In those sentences where the Yankee considers the influence of religion, restricting religion to churches he has established, keeping religion out of his educational system, the main narrator tends to be an Experiencer, one who is positive, neutral in strength, and slightly active in connotative word use. He is especially pleased that religious freedom, the kind that he has established, leads to a number of sects rather than to one "united Church." As an Experiencer stating his fears about a "united Church," the Yankee is slightly uncertain, weak, and passive. He claims on the surface that a united Church would mean "death to human liberty, and paralysis to human thought," a content supported by slightly weak, slightly negative, and somewhat active scores for connotation. The Yankee, to interpret these scores more carefully, seems to agree with the danger, but senses the possibility that not much can be done once the "united Church" is in place.

Upon returning to his own reign and to his own kingdom, the semantic scores revert to the positive, active, and powerful levels in general. The Yankee's underlying structure of connotation agrees with the surface structure that claims that he has made "handsome progress." But when the Yankee begins to discuss the amount of power he has acquired over the course of four years, the evaluation scores indicate a shift toward uncertainty, the other values remaining powerful and active. In considering himself a "despot," the Yankee lacks faith in the shape of things to come, as even on the surface he believes that "an earthly despotism" to be the "worst form" of government possible. The semantic loading for this section of the sample suggests that the growing society he has developed, the "civilization of the nineteenth century booming under" the "nose" of "this dark land," is one that he finds positive, powerful,

and active. The "volcano" the Yankee describes is an overwhelming force for the narrator, here an Experiencer in general. Only when the Yankee claims to be ready to "flood the midnight with light at any moment"--just as he had during the eclipse--do we find his responses to be somewhat undercut by a connotative level of uncertainty. The Yankee says that he plans to reveal this seething world of technology to the public world "one candlepower at a time," and is uncertain, slightly weak, and passive in his caution. Clearly the Yankee does not quite yet trust the people's faith in him, though he trusts a great deal the faith he has in his own technological prowess.

I used a sample from the chapter entitled "Battle of the Sand Belt" to analyze the emotions of the Yankee as he destroys the nobility. Of the 1,474 words parsed, some 387 were found in the semantic differential scale dictionary, giving a ratio of 0.26 found words per all words in this sample. Chi-square analysis suggests a high probability that found words occurred with consistent regularity across all sentences in this sample; the standard deviation scores for evaluation, potency, and activity are, respectively, 0.50, 0.43, and 0.49, fairly typical and average scores. The overall message given by the program for this sample suggests that the Experiencer feels evaluatively neutral, slightly weak, and neutrally active. These scores are remarkable for someone who has just slaughtered thousands and thousands of knights! How can this flattening of emotional response be interpreted? Does the Yankee really consider this murderous behavior to be in some way "normal"? Is there no emotion left to a narrator drained of enthusiasm for his technological world? Or is there any enthusiasm for his technology to be found inside this sample?

The opening sentences show a narrator weak, active, and slightly

positive (overall) as he begins to dismantle his empire, having been effectively surrounded by the medieval world of supersitition. The Agent of several sentences in this opening is uncertain, powerful, and passive, while waiting for something to happen. One can see that a measure of tension exists. Then the scores vary across sentences as the Yankee tells of how he has spent his time waiting for the outside world to do something; he has been compiling the manuscript that Twain presumably is reading. Only the evaluation level remains consistent for these sentences, that of some uncertainty. When he writes to his wife, the evaluation scores indicate a positive, active, and slightly weak response. At this point the Yankee still has some emotion left to him, emotion for writing the story of his life and emotion for communicating with his wife.

As the inevitable battle approaches, the Yankee is more uncertain, weak, and passive. As the knights begin to ride toward Merlin's cave, the Experiencer of these sentences is positive, weak, and somewhat active. It is as if the Yankee welcomes the challenge. But then, in a sentence that betrays all, the Yankee interrupts his positivism, by admitting that the people of England would not support him anyway. Here, as an Experiencer, the semantic scores suggest that he feels uncertain, weak, and passive. The activity level increases as the Yankee realizes that even the commoner and slave, the ones benefitting from his benevolent despotism, have become "sheep." The tension level rises. When he now realizes that "all England was marching against us," the Yankee watches his boys carefully, the emotional levels indicating an uncertain, weak, and passive response. He feels, eventually, that they, at least, will support him.

Prepared for battle, the Yankee feels slightly positive, somewhat powerful, and somewhat active in his use of connotative words. The dominant voice here is of an Experiencer. But when the "big day arrived," the narrator feels uncertain, remaining powerful and active in his responses. And when he surveys the battle lines, the "wonderful" sight of massed England, the Experiencer is passive, slightly powerful, and somewhat uncertain. The Yankee seems to lose his control of the situation as the moment for battle begins.

When the Yankee watches the first explosion of knights, the semantic scores suggest slightly positive, weak, and passive reactions to the destruction. But when the smoke clears, he feels somewhat uncertain, powerful, and passive. The Yankee feels overwhelmed by what he has wrought. When he finally destroys his factories, his entire civilization, the Yankee is uncertain, weak, and active. And when he reflects on his self-destructive act, he becomes uncertain, powerful, and active. These semantic loadings suggest that the Yankee is disappointed in the loss of his technological world but accepts the act of destruction as an event stronger in power than the power he thought he could control. The Yankee senses an end to his world, but cannot stop it, nor would he attempt to stop that destruction. He may now realize (but not in the open) the rightness of that act. In the ensuing mass destruction of England's nobility, the Yankee is uncertain, passive, and strong. Here these semantic loadings show a lifeless acceptance of overwhelming events beyond his control. At a number of points in the sample, where the Yankee contemplates the numbers of dead around him, his attitude is also uncertain, powerful, and passive, presenting a man beset with regret, guilt, and horror.

Whenever the Yankee takes action in this sample, the semantic levels are uncertain, weak, and passive. Whenever the Yankee looks over the mounds of dead men, he reflects levels of some strength and activity (fairly neutral in evaluation). One can, from this kind of analysis, suggest that the Yankee dreads having to take action against the world, even against his own technological civilization, but, having taken action, surveys this destruction of England with a high level of activity and strength, or with a high level of security. The Yankee, on the face of it, lacks any real emotion in his comments; the Yankee, underneath that emotionless face, reveals some kind of smugness in his faith that he has accomplished something useful; in short, the Yankee does feel he has done the right thing. The Yankee can now begin to admit that the capitalistic world he has re-created in sixth-century England is corrupt and deserved destruction. But Twain would not allow the Yankee to say quite that, although the semantic levels generated begin to provide that admission of a changed perspective toward Twain's own era.

Twain sought refuge in this double-denial, a denial of the world represented by sixth-century England--controlled by superstition, ignorance, and inherited rights--and a denial of the country developed in his own century--controlled by power, technology, and deception. His only refuge lay in his attempt to exteriorize his own doubts, but he could not successfully create a fiction without mirroring his own reality, a reality that Twain wanted to accept but could not.

Reality and fiction: Twain's psychological state in writing A Connecticut Yankee rests on his response to these poles. Fiction comes from reality; reality creates fiction. But for Twain neither could stand alone or

provide a pathway to the other. Twain could not assume (and did not want to) that his tale sprang from the real capitalistic democracy of his own time, nor could he admit that his doubts about his own era damaged the humor of the novel. He felt it necessary to declare his allegiance to a network of social values--democracy frees, superstition enslaves, an open market offers moral and ethical progress, ignorance prevents technological commonsense--but felt a deeper allegiance to the fiction as he wrote it. He did not concede the lapse of his capitalistic faith even when that fictional world collapsed, undercutting faith and humor together. His deeper allegiance was unconscious but urgent. Twain knew that he should accept technological progress (the reality) but found the philosophical tale (the fiction) as its embodiment contrary to his developing awareness of humanitarianism. That deeper allegiance resulted in a confusion of voices, a confusion of reality and fiction.

References

[1] David Heise, "Semantic Differential Profiles for 1,000 Most Frequent English Words," Psychological Monographs 79 (1965): 1-31. The working computer program and the set of words used with their accompanying scores are listed in an appendix to my dissertation. See Harold Hellwig, "Mark Twain's Response to Democracy and Technology: A Computer-Aided Psycholinguistic Analysis of A Connecticut Yankee in King Arthur's Court," Diss. University of California, Los Angeles, 1985: 197-303. On the theory behind the scale, see Charles E. Osgood, George J. Suci, and P. H. Tannenbaum, The Measurement of Meaning (Urbana: University of Illinois Press, 1957).

[2] Charles J. Fillmore, "The Case for Case," in Universals in Linguistic Theory, eds. Emmon Bach and Robert T. Harms (New York: Holt, Rinehart and Winston, Inc., 1968). For a theoretical examination of case grammar theory which suggests a cognitive basis for semantic structures inherent to language and for the psychological structures inherent to perceptual consciousness, see also Ray Jackendoff, "Grammar as Evidence for Conceptual Structure," in Linguistic Theory and Psychological Reality, eds. Morris Halle, Joan Bresnan, and George A. Miller (Cambridge, Mass.: M.I.T. Press, 1979).

[3] Heise describes the testing method used.

[4] Elizabeth Closs Traugott and Mary Louise Pratt, Linguistics for Students of Literature (New York: Harcourt Brace Jovanovich, 1980): 211-19. The discussion of case grammar in this text is clear and useful for a general description of Fillmore's syntactic structures.

[5] I used one model of an ATN from Eric Wanner and Michael Maratsos, "An ATN Approach to Comprehension," in Linguistic Theory and Psychological Reality, eds. Morris Halle, Joan Bresnan, and George A. Miller (Cambridge, Mass.: M.I.T. Press, 1979). For a general introduction to the kinds of parsers developed in this field, see also Avron Barr and Edward A. Feigenbaum, eds, The Handbook of Artificial Intelligence, 3 vols (Los Altos: William Kaufman, 1982): Vol. 1.